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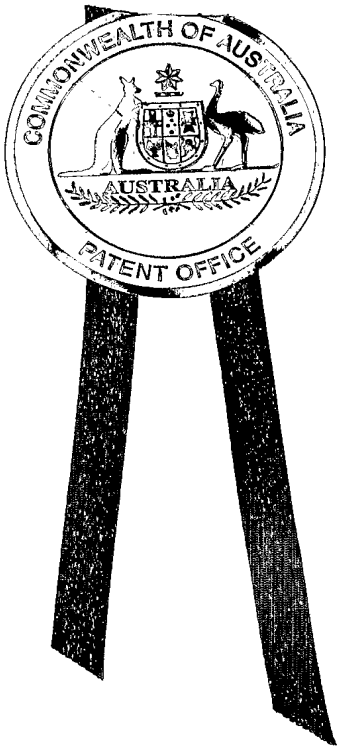

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PROVISIONAL SPECIFICATION

Invention Title: **Panel constructions and assemblies made therefrom**

The invention is described in the following statement:

PANEL CONSTRUCTIONS AND ASSEMBLIES MADE THEREFROM

The present invention relates to a novel support panel and containers or similar products assembled therefrom.

BACKGROUND OF THE INVENTION

It is known to form panels, containers or objects from a variety of materials and constructions. Commonly used materials include wood including plywood, cardboard including corrugated cardboard, expanded polystyrene, polyurethane, glass, and rigid and semi-rigid plastics including corrugated plastic board and the like. Each of these materials has certain advantages for particular applications but most also have disadvantages making their use at best a compromise in many applications. For example, wood is a relatively expensive material that is difficult to fabricate into panels, containers or crates. Panels, containers and crates made from wood are also generally quite heavy. Cardboard is relatively inexpensive both as a material and in fabricating same into a container or the like, however, it is not waterproof. Polystyrene formed into a container, box or crate is expensive to freight because of its volume. Wood including plywood and rigid or semi-rigid plastics provide limited or no protection against damage to products packed inside such containers and provide limited thermal insulation qualities.

SUMMARY OF THE INVENTION

The present invention aims at providing an inexpensive novel object or panel construction and assemblies utilising such an object or panel construction including containers and the like, that will overcome many of the aforementioned difficulties with known materials and constructions.

Accordingly, the present invention provides an object or panel construction including an inner support frame means and an outer skin at least partially enclosing said support frame means formed at least in part by a plurality of layers of at least one flexible web wound about said support frame means whereby at least some of said layers are adhered to other said layers. Preferably the outer skin may fully enclose the support frame means. Preferably, at least one said flexible web may be a plastics film. Conveniently, the outer skin may be made completely of one or more flexible plastics film webs, or it may be made of plastics film web and at least one other web, for example of a reinforcing mesh or other material. The object or panel construction accordingly may provide,

depending on the embodiments utilised, a relatively lightweight panel construction that is inexpensive to produce and which may be waterproof and may also provide protection for the goods that might be packed in a container utilising such panel constructions.

Preferred features of the object or panel construction may be as defined in claims 2 to 23 annexed hereto, the subject matter of these claims being hereby incorporated into the disclosure of this specification by the reference thereto.

As used in this specification, the terms "support frame means", "frame element" and the like are intended to convey a meaning of both a continuous support element such as, for example, a sheet of corrugated cardboard or similar, or an open frame with an outer perimeter support defining a largely open space in between, either being generally planar in form or three dimensional in form.

The present invention also anticipates utilizing panel constructions as described above in an assembled form to provide a container or a wall construction for various applications as defined in claims 25 to 29 annexed hereto. The subject matter of these claims is also incorporated into the disclosure of this specification by this reference thereto.

The present invention also proposes to utilize a wall construction element including at least one rectangular shaped panel construction as described above and further including retainer means engaging and retaining opposed edges of the panel construction. Preferred features of such a wall construction element may be as defined in claims 31 to 33 as annexed hereto, the subject matter of these claims being hereby incorporated into the disclosure of this specification by this reference thereto.

According to a still further aspect of this invention there is provided a panel construction including an inner support frame means and a flexible outer skin at least partially enclosing said support frame means formed at least in part by a plurality of layers of at least one flexible web wound about said support frame means whereby at least some of said layers are adhered to other of said layers, said support frame means having two mutually parallel first frame members spaced from one another with each said first frame member having at least one hinge zone such that the hinge zones in the spaced first frame members are arranged in at least one pair with the or each said pair defining a hinging axis

about which portions of the first frame members on either side of said hinge zones can be positioned into differing relative dispositions, after having said flexible outer skin applied to said inner support frame means. Preferred features of this further aspect may be as defined in claims 35 to 49 annexed hereto, the subject matter of these claims being hereby incorporated into the disclosure of this specification by this reference thereto.

In accordance with another aspect of this invention there is provided an object including inner support frame means defining a substantially open region within outer perimeter dimensions of said inner support frame means and an outer skin at least partially enclosing said inner support frame means formed by a plurality of layers of at least one flexible web wound about said support frame means whereby at least some of said layers are adhered to other of said layers. Preferably the object is in the form of a panel defining a sealed zone within the outer skin, the sealed zone having a resealable inlet / outlet opening whereby the sealed zone can hold and retain a liquid. Conveniently a container may be formed from an object of the type described above. Preferably such a container may have the features defined in claims 52, 53 and 54 annexed hereto, the subject matter of which claims are hereby made part of the disclosure of this specification by this reference thereto.

The present invention also provides a flat panel assembly including a plurality of panels, each said panel having a substantially rigid perimeter frame formation defining a substantially open space inwardly of said substantially rigid perimeter frame formation, said frame formation being at least partially enclosed by a plurality of layers of a flexible plastics film web material wound about said frame formation, said panels being configured with an edge of a said panel being located adjacent an edge of at least one other said panel, and an outer envelope of a plurality of layers of a flexible plastics film web material encompassing all of said panels. Preferred features of this aspect may be as defined in claims 56 to 60 annexed hereto, the subject matter of these claims being hereby made part of the disclosure of this specification by this reference thereto. A container as defined in claim 61 annexed hereto may be formed from such a flat panel assembly.

The present invention also provides apparatus for wrapping a support frame means with an outer skin formed at least in part by a plurality of layers of a flexible web wound about said support frame means, said apparatus including a first conveying means and a second conveying means, the first and the second conveying means being arranged to move the support frame means to and fro between the first and second conveying means, and a roll of said flexible web disposed between the first and the second conveying means being movable between a relatively elevated position and a relatively lowered position, the flexible web being successively positioned along a first face of the support frame means with the roll of said flexible web in the elevated position as the support frame means moves between the first and the second conveying means, whereupon, the roll of said flexible web moves to the lowered position and the flexible web is positioned along a second face of the support frame means opposite to said first face as the support frame means moves again between the first and the second conveying means.

Preferred features and aspects of the aforementioned apparatus may be as defined in claims 63 to 66 as annexed hereto, the subject matter of these claims being, by this reference thereto, incorporated into the disclosure of this specification.

In accordance with another aspect, the present invention also provides apparatus for wrapping a support frame means with an outer skin formed at least in part by a plurality of layers of a flexible web wound about said support frame means, said apparatus including a first conveying means and a second conveying means being arranged to move the support frame means between the first and the second conveying means, and at least one roll of flexible web disposed generally between said first and said second conveying means and disposed to orbit about said support frame means as it moves between the first and the second conveying means to lay helical windings of said flexible web onto said support means, said apparatus further including first flexible web application means to apply at least one flexible web length either below or over the helical windings in a longitudinal direction of said support frame means on opposed faces of said support frame means. Conveniently the apparatus further includes second flexible web application means to apply at least one flexible web on the

other side of said helical windings to the flexible web applied by said first flexible web application means, the flexible web applied by said second flexible web application means being applied in said longitudinal direction on opposed faces of said support frame means.

BRIEF DESCRIPTION OF THE DRAWINGS

Many other applications for the panel construction of this invention will become apparent from the following description of preferred embodiments given in relation to the accompanying drawings, in which:

Fig 1 is a schematic front view of a panel construction according to a preferred embodiment of the present invention;

Fig 1a is a section view along line A-A of Fig 1;

Fig 2 is a schematic perspective view of a container utilising a plurality of panel constructions as shown in Fig 1;

Fig 2a is a partial section view along line A-A of Fig 2;

Fig 2b is a partial section view along line B-B of Fig 2;

Fig 2c is a partial section view along line C-C of Fig 2;

Figs 3a to 3f are section views of possible elements for forming the perimeter rigid frame formation of panel constructions according to preferred embodiments of the present invention;

Fig 4 is an edge elevation view of a possible further preferred embodiment of the present invention;

Fig 5 is a partial plan view of a frame construction used in the preferred embodiment of Fig 4;

Fig 5a is a partial plan view similar to Fig 5 showing a further preferred embodiment adapted to enable production of a partially or fully enclosed container.

Figs 5b and 5c are illustrative examples of alternative embodiments for making a hingeable frame assembly;

Fig 6 is a plan view, in flat construction format, of an assembly of panel members capable of being formed into a liquid retaining container;

Fig 7 is a perspective view of the assembly shown in Fig 6 erected into the liquid retaining container;

Fig 8 is a plan view of the preferred embodiment shown in Fig 4 formed into a tubular configuration;

Fig 9 is a detail view of the corner marked A of the configuration shown in Fig 8;

Fig 10 is a detail view of each of the corners marked B of the configuration shown in Fig 8;

Fig 11 is a schematic perspective view of a possible wall configuration for utilising panel constructions according to the present invention, particularly for forming a container on a pallet base;

Fig 11a is a partial section view along line A-A of Fig 11;

Fig 11b is a partial section view along line B-B of Fig 11;

Fig 12 is a schematic plan view of one possible apparatus for producing panel constructions according to a preferred embodiment of the present invention;

Fig 13 is a schematic side elevation view of the apparatus illustrated schematically in Fig 12; and

Fig 14 is a schematic side elevation view of a further preferred embodiment for producing panel constructions according to preferred embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs 1 and 1a of the annexed drawings illustrate, by way of example only, one possible preferred embodiment of the present invention. In this embodiment a panel construction 10 is provided with a rigid perimeter frame 11 and an outer skin 12 totally enclosing the frame 11. The outer skin 12 is made up of layers of flexible plastics material film wound onto the frame 11 with the layers being at least partially adhered to one another. Conveniently, at least one such layer of film web might be wound onto the frame 11 in a first cross direction with at least one further layer of the film web being wound onto the frame 11 in a second cross direction transverse to said first cross direction. If desired, two or more layers of the film web may be wound in the first cross direction prior to winding at least one or conveniently two or more layers in the second cross direction. Preferably, the angle between said first and second cross directions is between 60° and 120°, and most preferably at about 90°. It is preferred that the flexible plastics material

web be slightly greater in width than the width of the frame 11, however, if the frame 11 is larger in size than the available film web width, then the film web may be spirally wound onto the frame 11 with the web being applied overlapping a previously applied web length. Alternatively, the film may be applied in a plurality of partially overlapping spaced sections. The number of layers of film web applied to the frame 11 to form the outer skin 12 may be varied to achieve a desired strength and other performance characteristics for the intended use of the panel construction. The film web forming the outer skin 12 may be self adhesive plastics film which may have had an adhesive additive included in the film material formulation, or the film might be coextruded film including at least two layers in which one outer layer is formed by an adhesive resin. In a still further possible arrangement, an adhesive might be applied to or coated on a surface of the film prior to or during its application to the frame 11 to form the outer skin 12. In another possible arrangement, a laminating adhesive layer might be applied between non-adhesive layers of flexible web material.

If the frame 11 is totally enclosed by the outer skin 12, air is initially trapped in the cavity or space 13 within the frame 11. Further air may then be trapped with each subsequent wrap of film web either in the cavity 13 or between the layers of the film web. By repeating this process, the desired insulating properties and/or cushioning properties can be achieved for the panel construction 10. If the film web is applied with pressure to the frame 11, the pressure applied to the frame by the film tends to increase the seal between layers of the film web to trap the air in the cavity 13 and/or between the layers as described above.

It has also been found that by applying the film web loosely or dimpling the film web prior to or as it is applied will cause more air to be trapped between the layers of the outer skin 12, if this is desired. A further possible option is to provide a dimpling or similar effect on inner or intermediate layers of the film web with smooth or flat film web layers applied as outer layers to improve the outward appearance of a panel construction formed in this manner.

The pressure of the air remaining in the cavity 13 may, if desired, be controlled by perforating one or both sides of the outer skin 12 or the layers of the

outer skin 12 to ensure that the air within the cavity 13 remains at atmospheric pressure regardless of its temperature when used.

The panel construction 10, in one preferred arrangement may be weatherproof and/or waterproof and can be used for external applications or internal applications where the panel construction or product made therefrom, might be subject to degradation by excessive moisture levels. A panel construction in accordance with this aspect where the internal cavity 13 is sealed, at least on one side, might be used in applications such as a raft or other floating uses such as a cover for swimming pools and other water holding facilities. A plurality of such panels could also be formed together to form such devices as rafts or floating covers for pools and the like.

In Figs 1 and 1a, the frame 11 is fabricated from a metal such as steel or aluminium (or alloys thereof), or perhaps from a rigid or semi-rigid plastics material having an L-cross-section 14 as shown in Figs 3a and 3b. The length of the legs 15, 16 of the L-section members 14 might be the same or could be different, however, if a container such as is shown in Fig 2 is to be produced, then it is preferable that the legs 15, 16 be of equal length. In use the outer skin 12 forms a bevelled surface 17 between the outer edges of the legs 15, 16. Alternatively, a triangular section such as shown in Fig 3d might be used which presents a surface 18 over which the outer skin 12 might be formed equivalent to the bevelled surface 17. Fig 3c shows another triangular section for the members 14 which presents a pair of bevelled surfaces 19, 20 over which the outer skin 12 might be formed. Fig 3e shows a possible semi-circular cross-section having an outer curved surface 21 over which the outer skin might be formed. It is believed this section improves the sealing of the film web layers to one another if this characteristic is desired. Fig 3f illustrates another possible rectangular (or square) cross-section presenting an outer square or flat surfaces 22, 23 and 24 over which the outer skin 12 might be formed. A similar effect with a lower weight level might be achieved utilising a channel or C-section with the legs of the C-section facing inwardly or outwardly. While Figs 1 and 1a show one preferred embodiment utilising a square (or rectangular) rigid perimeter frame 11, it will be appreciated that, depending upon the application, other shapes might be employed including triangular shapes and other polygonal shapes. The frame 11,

as shown in Figs 1 and 1a, is illustrated as being fabricated from individual members 14, however, it may in some applications be moulded or cast in one piece. The frame 11 needs to be sufficiently rigid to support the outer skin 12 of flexible plastics material web applied to it but the material used to form the frame 11 could vary depending upon the application and depending upon whether the frame 11 is to be recycled or reused as discussed below. Suitable materials, depending upon the application, might include metals and metal alloys, timber, formed cardboard, rigid plastics material, a flexible inflatable plastics material or combinations of the aforesaid materials. Moreover, internal stiffening or reinforcing members to achieve the required stiffness of the frame 11 might be used.

Figs 2, 2a, 2b and 2c schematically illustrate a container or box 25 having a base wall 28 (see Fig 2c), from upstanding side walls 26 (two of which are shown) and a lid or closure wall 27. Each of the base, side and upper closure walls may be formed by a panel construction 10 as illustrated in Figs 1 and 1a. It will be appreciated that by varying the shape and the dimensions of the panel constructions 10, containers of differing sizes and shapes might be produced. Many variations are possible including but not limited to providing a container without an upper closure or lid, and providing polygonal (other than square or rectangular) containers by providing a polygonal shaped base wall (and, if required, lid) with rectangular (or square) side walls connected to each side of the polygonal shaped base wall. With the preferred embodiment illustrated in Fig 2, the panel constructions 10 each have bevelled edge faces 17 disposed at 45° to the plane of the panel construction such that adjacent panel constructions form a 90° corner with the bevelled edge faces 17 contacting one another (see Fig 2a). The side walls 26 may be hingedly connected to the base wall 28 by the use of adhesive tape 29 applied substantially fully along the adjacent edges of the panel constructions.

In the upright or assembled condition of the container or box 25, the side walls 26 are maintained adjacent one another by releasable fastening means 30 such as a Velcro (registered trade mark) fastening tab or the like. The lid or upper closure wall 27 might be simply loosely applied or it may be connected to a side wall 26 by hinging tape 31. When the container is packed, each of the

adjacent edges of the panel construction might be secured by sealing tape. If desired, one or more releasable fastening means (such as tabs 30) might be applied to releasably secure the lid or upper closure wall 27 in the closed state.

In an alternative arrangement, the panel constructions 10 forming the container might be temporarily held in the finished or erect state and thereafter have a further layer or layers of plastics material film web wound around the container to secure same in the erect state. Alternatively, adhesive tape material or strapping material could also be used to hold the container in the erect state. This may include the side walls and base wall only or might also include the upper lid or closure wall. If desired, advertising, promotional or other printed material might be provided on a sheet placed on an outer wall surface of a panel construction with the sheet being retained in place by an outer layer or layers of clear or transparent plastics material film web wound around the panel construction. Alternatively, if the container is to be formed as described above with an outer wrapping of plastics material film web, then the printed material sheet might be located between this outer wrapping (if it is clear or transparent) and the previously formed panel constructions.

As will be apparent, containers of the above described type might be readily shipped to an end user in a flat condition to be erected, packed and secured in a suitable manner. Containers may be shipped either as individual panel constructions or as such panel constructions hingedly connected to one another. It is believed that the rigid perimeter frames 11 might be formed and arranged in adjacent formation to be wrapped with plastics material film web or webs simultaneously such that the plastics material film web will form hinging and connection means between panels intended to form a container or the like.

In a possible further preferred embodiment, rigid perimeter frames 11 as aforesaid may be initially connected by hinge means such as a flexible hinge sheet or part glued or otherwise fastened to adjacent edges of the rigid perimeter frames 11 allowing the adjacent edges of the frames 11 to pivot about a hinge axis between and parallel to the adjacent edges. The thus interconnected frames 11 may then be wrapped with plastics material film web or webs such that the film web will then also span the zones between adjacent edges of the panels of a container or the like formed therefrom.

Figs 4 to 5c and 8 to 10 of the annexed drawings illustrate, again by way of example only, a further possible preferred embodiment of the present invention. In Figs 4 and 5, a rectangular frame assembly 70 is formed by a pair of side bars 71 (only one of which is shown) and a pair of end bars 72, 73. Three spaced intermediate cross bars 74, 75 and 76 are provided welded, glued or otherwise fastened at each end to the side bars 71. In the embodiment illustrated the bars 71 to 76 have an angle bar or L-shape cross-section and may typically be formed from metal, plastics material, cardboard or any other materials identified in the preceding test. It will also be recognized that although an L-shaped configuration has certain practical advantages, other cross-sections for the bars 71 to 76 could be used, as described elsewhere in this specification, depending upon the end product or use being made of the assembly. As is further shown in Figs 4 and 5, hinge zones 77, 78 and 79 may be formed in the side bars 71 to define hinge axes 80, 81 and 82. Each hinge zone 77, 78 or 79 might be formed cutting the web 83 of the side bars 71 to form bevelled notches 84 angled towards the hinge axes such that the side bars 71 can be bent around the hinge axes to form a square tubular shape 86 as illustrated in Fig 6. It will readily be appreciated that the number of hinge axes 80 to 82 and the angle of the bevelled notches 84 may be selected so as to allow the assembly to be bent into any tubular shape including rectangular, triangular, hexagonal or any polygonal shape. Two or more such frame structures might be combined to produce a desired end product. In the bent and formed configuration shown in Fig 8, the cross bars 74, 75, and 76 together with the two end bars 72, 73 form the upright corners of the tubular structure formed by this process.

Before the frame assembly 70 is bent about the hinge axes 80 to 82, the assembly 70 is wrapped by one or more flexible plastics material film webs, as with the previously described embodiments, to provide a skin 12 on both sides and around the edges of the frame assembly. Preferably a film web having a width equal to the distance between the side bars 71 might be wrapped longitudinally around the frame assembly 70 passing in one or more layers about the end bars 72, 73. If the distance between the two side bars is too great for the available film width then two or more film webs mutually spaced but overlapping might be utilized in the first wrapping step. Subsequently one or more flexible

plastics material webs might be helically wrapped about the frame assembly 70 passing circumferentially about the side bars 71 and extending along the frame assembly in overlapping relation between the two end bars 72, 73. Thereafter a second layer of longitudinally wound film web or webs might be provided over and around the end bars 72, 73 and extending in a similar direction to the first mentioned layer. Alternatively two layers of helically wound flexible film web material may be provided separated by one layer of longitudinally wound material. Further layers of flexible plastics material may be built up on previously formed layers until the desired performance level for any particular application has been achieved. The nature of the flexible plastics material film and any related performance characteristics may be as described with earlier embodiments. Once the flexible plastics material film web skin 12 has been formed, the frame assembly is bent to the tubular structure 86 shown in Fig 8 and the adjacent engaging edges formed by the end bars 72, 73 might be secured together by any suitable means such as adhesive tape 85 or by further over wrapping the tubular structure thus formed with additional layers of plastics material film web.

It will of course also be recognized that if required, the tubular structure formed as described above might be formed into a container by providing a lid and/or a base constructed as described above with reference to preceding embodiments. One possible use for containers of this type might be for packaging white goods or many other products in an inexpensive and convenient manner.

Fig 5a illustrates yet another possible preferred embodiment similar to Fig 5 but having differing features as described hereinafter. In this case the frame assembly 90 is also formed from angle or L shaped material, typically metal, cardboard or plastics material with hinging zones 97, 98 and 99 formed in a longitudinal bar member 91. A second such bar member is located in the opposite side (not shown) and the two bar members are connected by transverse bar members 94, 95, 96 and an end bar member 93. A second end bar member and further transverse bar member is not illustrated. The arrangement is such that the respective bar members are connected to define a base panel 100, two side panels 101 and two lid forming panels 102 (only one of which is illustrated). A pair of further frame members 103 adapted to form side panel members 104

(again only one of which is shown) are positioned adjacent to the base panel 100 and extend laterally therefrom. The frame members 103 might be positioned loosely next to longitudinal bar members 91 and hinged thereto by the covering outer skin subsequently applied thereto. In some cases specific hinge means might be used to connect the frame members 103 to the bar members 91. In some cases, the frame members 103 might need to be spaced from the bar members 91 and in this case "rigid" hinge means might be required, ie rigid in the sense that it would resist forces applied by the subsequent film wrapping process in the plane of the frame assembly 90 but have one or more hinge zones to permit hinging of the frame members 103 relative to the bar members 91 when erecting a container or the like. It will of course be appreciated that in some cases a hinged lid might not be required and lid forming half panels 102 might therefore be omitted. The broken outline 104, 107 in Fig 5a indicates the envelope of the outer skin 12 after wrapping plastics film web onto the frame 90. The portions 105, 106 would need, after erection of the container, to be folded against the outer surface of the container by adhesive tape or further over wrapping of the container with plastics film web. It will also be readily apparent that a container constructed in this manner is also liquid proof such that the container might be used to hold, store or transport liquids or semi-liquid materials.

Fig 5b illustrates a possible corner structure utilizing hinging zones 110 in rigid tube material 113 where one leg 112 is bent in the direction of arrow 111 to form a three dimensional structure from an originally formed flat frame that might be wrapped with plastics film web as described herein. Fig 5c illustrates a similar arrangement but where the frame forming material is solid flat rectangular strip material 114.

Referring to Figs 6 and 7, another method of making a container that may be made liquid proof, ie capable of containing liquids and other flowable materials as shown in Fig 6, a plurality of panels 10, constructed, for example, as shown in Figs 1 and 1a are provided and configured with one central panel 10 adapted to form a container base 131 of the container 130 and a number of similar panels 10 each adapted to form a sidewall panel 132, 133, 134 and 135 of the container 130 such that one edge of each side wall panel 132 to 135 is arranged closely adjacent an edge of the base wall panel 131. In the illustrated embodiment, each

of the panels 131 to 135 are generally square but it will be appreciated that rectangular panels could also be used. The base 131 could also be triangular or some other polygonal shape if desired. Each of the panels 131 to 135 may be wrapped in plastic film material envelope 12 as is the case in any of the embodiments described herein. Conveniently the internal frame member 11 of each panel is constructed to provide a bevelled film surface at each edge that cooperates with a similar bevelled film surface on an adjacent panel member when configured into a container shape. The arrangement 137 of panels 131 to 135 might be simply positioned as illustrated in Fig 6 with edges closely adjacent one another, or they may be partially retained in this configuration by applying a hinging tape or the like to the film surfaces of adjacent panels 10. Whichever method is used, the arrangement 137 of panels 131 to 135 are then over wrapped with plastic film, preferably having a width equal to or in excess of the width of three panels 10 as illustrated. Alternatively the over wrapping might be by two or more film webs that overlap one another. The film web or webs are preferably wound about the panel arrangement 137 in a first direction parallel to sides of the panels 10 laying two or more layers of film via such winding. Then the film web or webs might then be wound in a second direction generally 90° to said first direction to lay two or more layers of film in this second direction. The process may thereafter be continued (or not) until sufficient layers of film have been wound over the panel arrangement 137 to form a liquid tight envelope 138. The envelope 138 in the specific embodiment illustrated in Fig 6 is generally square with square flaps 139, 140, 141 and 142 in its corners made only of plastics film material. Thus when the side panels 132 to 135 are rotated upwardly relative to the base panel 131 to form a container 130 as shown in Fig 7, the corner film portions 139, 140, 141 and 142 form triangular flaps 143 that may be folded against the side panels 132 to 135. The container formation 130 as shown in Fig 7 may be retained in the erected formation by any suitable means but one preferred method is to over wrap the side walls and triangular flaps with a further layer or layers of plastic film 144. It will of course be apparent that a top panel 10 might be provided to close the container thus formed or closure (if required) might be achieved by over wrapping the top with plastics material film in one or two perpendicular directions. The envelope 138 ensures that the edges of container

130 cannot leak liquids or other flowable materials that might be kept within the container 130.

Figs 11, 11a and 11b illustrate another product in which a panel construction 10 might be used. In this further preferred embodiment, a container is formed on a pallet construction 40 of any suitable type having a supporting base wall 41. Corner posts 42 might be releasably positioned at the corners of the base supporting wall 41 with each of the corner posts 42 having channel members 43 secured thereto with the open channel 44 of the channel member 43 facing along a side or end edge of the supporting base wall 41. If desired, a base channel member 45 having its open channel 46 facing upwardly is positioned along each side or end edge of the base wall 41. The base channel members 45 may also be releasably connected to the pallet construction 40. As is shown in the drawing, a pallet construction 10 might be positioned and retained in the open channels 44 and 46 of the channel members 43 and 45. With larger panel constructions 10 as might be needed in this application, it may be desired to provide at least one internal strengthening rib or bar traversing the internal cavity 13 in at least one direction with opposed ends of same being connected to a portion of the rigid perimeter frame 11.

In another preferred embodiment the internal frame structure might be formed by cardboard or corrugated cardboard or moulded plastic with crease lines being positioned to allow the panel construction to be folded about same in use. The internal frame structure might then be wrapped with a flexible plastics film web (or webs) in one (or two) directions about the edges of the internal cardboard or plastic frame with overlapping layers being at least partially adhered to one another. Such a construction might typically be used as supporting and protective packaging for individual bottles such as wine bottles or the like.

In a still further preferred embodiment, a container for retaining, carrying, transporting or storing liquids and flowable materials may be produced utilising a structure comprising an internal support frame defining an internal space or zone with the frame being wound with flexible plastics material film in a plurality of layers. In the case of the frame and therefore, the container, being cuboid in shape, the plastics material web may be wound about the frame in three directions disposed at 90° to each other to completely cover the six faces of the

cuboid shape to form a sealed zone within the outer skin. An opening can then be formed in one face of the outer skin to provide an access means for filling and dispensing liquid or particulate material from the container. The opening may further include resealable closure means if desired.

Figs 12 and 13 illustrate schematically one possible form of apparatus for manufacturing objects or panel constructions 10 as described in the preceding text. It will of course be appreciated that many other forms of apparatus might be used including manual and semi-manual techniques. Fig 12 shows a plan view of the apparatus with Fig 13 showing a side elevation view of the apparatus. The illustrated apparatus 50 includes three pairs of conveyors 51/52, 53,54 and 55/56, with the conveyors in each pair confronting one another with a work space in between adapted in use to receive a rigid perimeter frame 11 in between the conveyors. The conveyor pairs 53/54 and 55/56 are adapted to pass the frame 11 between the respective pairs as indicated by arrows 57 as described hereafter. Between the respective pairs of conveyors 53/54 and 55/56, a roll 58 of flexible plastics material film web is positioned to apply the film web to the frame 11 essentially as it moves by the conveyor pairs and between the conveyor pairs. The roll of film 58 is also movable vertically as indicated by arrow 60. Finally the pair of conveyors 53/54 may be bodily rotatable about the pivot axis 61 such that they might cooperate with the pair of conveyors 55/56 or with a separate pair of rollers 51/52 utilising another film roll 59 movably similarly to the roll of film 58.

Reference will now be made to Fig 13 as annexed hereto. With the frame 11 initially in the left hand illustrated position with a film web 62 positioned along a lower face of the frame 11 and the roll 58 in the lower position 63, the roll 58 is moved vertically to its upper position 64 and the frame 11 is moved to its right ultimately to the position illustrated at 11'. In this position, the film web 62 has been positioned along the upper face of the frame 11. At this point the film roll 58 is moved again to its lower position 63 and the frame 11 is moved to the left hand position by the conveyor pairs 55/56 and 53/54. In so doing a second layer of film web is applied over the first laid layer along the lower face of the frame 11. The process is repeated to apply the desired number of layers of the film web 62 to the frame 11. When this has been completed, the film web 62 is severed and the

conveyor pair 53/54 is rotated through 90° about axis 61 carrying with it the partially wrapped frame 11. The wrapping process is then repeated with the partially wrapped frame 11 being again passed between conveyor pairs 53/54 and 55/56 with the film web 62 from roll 58 being applied at an angle of substantially 90° to the first laid web. It will of course be appreciated that the same effect may be achieved without the conveyor pair 53/54 being bodily rotatable about the axis 61, by similarly removing the partially wrapped frame 11 and manually or semi-manually reorienting the frame 11 to the 90° position before repositioning same between the conveyor pairs 53/54. If it is desired to conveniently apply a differing film or other web material 65, a second pair of confronting conveyors 51/52 may be provided, 90° disposed relative to the conveyors 53/54, with a roll 59 of the required film or web material 65 disposed between the conveyor pairs 51/52 and 53/54. The roll 59 is disposed at 90° to the first roll 58 and is movable in a similar manner to the first roll 58. In a still further possible arrangement, four pairs of confronting conveyors might be provided with the first and second pairs being disposed at 90° to the third and fourth pairs of conveyors. The frame 11 in such an arrangement would be wrapped in a first direction by cooperation of the first two pairs of conveyors and an intervening roll of film, before being passed between the second and the third pairs of conveyors to thereafter be wrapped in a second direction by an intervening roll of film or web material between the third and fourth pairs of conveyors. In any of the above embodiments, the process of wrapping in separate directions might be repeated as many times as desired. Preferably each of the webs 62/65 has a width slightly greater than that of the frame 11 with press means (not shown) to press the extending edge portions against side edges of the frame 11. Conveniently the arrangement of each conveyor pair such as the illustrated pairs 51/52, 53/54 and 55/56 might be adjustable to accommodate differing thickness, width and length frames 11.

Fig 14 illustrates another possible method of forming the outer skin 12 on any of the frame assemblies described in this specification. In this embodiment a pair of conveyors 120, 121 are provided to support a frame 122 while moving same to the left or to the right as illustrated in Fig 14. A pair of film rolls 123, 124

are provided to lay a film web along the top and the bottom of the frame 122 while a second pair of film rolls 125, 126 orbit around the frame 122 between the conveyors 120, 121 to lay film in overlapping helical windings on the first laid film from the rolls 123, 124. Finally a second pair of film rolls 127, 128 are provided to apply film over the spirally wrapped film layers from rolls 125, 126 in the same general direction as the rolls 123, 124. It will of course be recognized that one of the rolls 125, 126 might be omitted or additional rolls could be added to apply the spirally wound layers. The process might also be repeated by running the partially wrapped frame 122 in a reverse direction (right to left) through the machine.

In a still further aspect, because the panel constructions 10 or container 25 formed therefrom has air trapped in the cavity 13 and/or between the film layers, such panel constructions and containers formed therefrom have excellent heat insulation properties. This would be an advantage and/or necessity when the containers are used for frozen or chilled produce, for example in manufacturing refrigerated containers, replacing Styrofoam for packaging fresh or frozen fish or produce or large produce bins used in a coolstore. The panel constructions could be used for temporary housing remaining cool in the summer and retaining heat in the winter. The same would apply for greenhouses because the panel constructions are insulated, heating and/or cooling costs would be greatly reduced. The panel constructions could also be used as insulation in buildings replacing other insulation methods. Because the volume of film is low per square metre the amount of flammable material is minimal although it may be preferable to at least treat the external layers of film with a fire retardant additive. In relation to a possible fire risk, there is substantially less material to burn when compared to Styrofoam or polyurethane.

If the panel constructions were to be used for more permanent building or other structures, they could be coated with plaster, render, rigid plastic, steel or aluminium sheeting or some other appropriate finish for example in refrigerated containers, coolstores, insulated building structures *etc.* In the case of such containers or panels because the insulation is film and air and the film acts as a support, such panel constructions and containers have a much reduced weight

when compared to other known constructions thus leading to much lower freight cost and building loadings.

In a further aspect, because the walls of the container or the panel construction are made with flexible film and are filled with air, products packed in such containers are in contact with flexible walls and base and are therefore better protected than in other containers or panels. Similarly, when the container does include a lid, the lid may be similarly constructed providing a similar improved level of protection for the container contents. Thus a container made in such a manner could be used as a protective package for whitegoods and other breakable and/or valuable products. This would also be important when packing and storing fruit and vegetables as there are minimal solid surfaces to bruise or damage such produce. Smaller containers could be used for packaging wine bottles or the like.

In a further important aspect, the main cost in the production of such panel constructions or containers is the framing material and fabrication of the frame. It is therefore highly desirable that after use or damage the panels or containers are either re-wrapped over the existing film or the film is stripped off and the frames are simply wrapped again to produce another panel or container using the same framing material. Thus containers or panel constructions made as described above are reusable and recyclable for many years.

In another aspect, panel constructions utilising waterproof materials for the frame 11 makes it possible to store and run liquids in such frames or the panel constructions. Such panel constructions can be used for storing, heating, solarisation and purification of water. They can also float on dams, canals *etc.* to reduce evaporation.

In a still further aspect, the frame 11 may be wrapped with a plastic film that will shrink when subjected to an elevated temperature whereby such panel constructions may be passed through an oven or over or past heating means to shrink the film onto the frame 11. The resultant panel or other object will have an improved taut and smooth outer surface.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An object or panel construction including an inner support frame means and an outer skin at least partially enclosing said support frame means formed at least in part by a plurality of layers of at least one flexible web wound about said support frame means whereby at least some of said layers are adhered to other of said layers.

2. An object or panel construction according to claim 1 wherein said support frame means is a single frame element.

3. An object or panel construction according to claim 1 wherein said support frame means includes at least two frame elements, the or each said frame element being spaced apart and wound by said flexible web or webs such that the flexible web or webs between adjacent frame elements forms a hinge means.

4. An object or panel construction according to claim 2 wherein said single frame element includes at least two parts interconnected by hinge means.

5. An object or panel construction according to claim 4 wherein the single frame element is a cardboard element including at least one crease line forming said hinge means.

6. An object or panel construction according to any one of claims 1 to 5 wherein the inner support frame means is fully enclosed by said outer skin.

7. An object or panel construction according to claim 6 wherein the flexible web or webs are wound in at least two directions disposed at a different angles relative to each other.

8. An object or panel construction according to claim 7 wherein the angle is substantially 90°.

9. An object or panel construction according to any one of claims 1 to 8 wherein the outer skin includes multiple layers of a flexible plastics film forming said flexible web or webs.

10. An object or panel construction according to claim 9 wherein the object or panel construction is passed through or by heating means to heat shrink the flexible plastics film onto said support frame means.

11. An object or panel construction according to claim 9 wherein air is trapped and retained within said outer skin.

12. An object or panel construction according to any one of claims 9 to 11 wherein said outer skin is perforated at one or more locations.

13. An object or panel construction according to any one of claims 9 to 12 wherein air zones are trapped between said layers of said flexible plastics film.

14. An object or panel construction according to any one of claims 9 to 13 wherein the flexible plastics film web or webs include self adherent characteristics.

15. An object or panel construction according to any one of claims 1 to 14 wherein a separate adhesive or adhesive layer is used to adhere the layers of the flexible web or webs together.

16. An object or panel construction according to any one of claims 2, 3 or 4 wherein the or each said frame element includes a perimeter substantially rigid frame formation defining a substantially open space inwardly of said perimeter rigid frame formation.

17. An object or panel construction according to claim 16 wherein the perimeter rigid frame formation includes a portion with an outer edge zone adapted to form at least one bevelled edge region when the outer skin of said plastics film web or webs has been wound thereon.

18. An object or panel construction according to claim 17 wherein the bevelled edge region or regions extends fully around the perimeter rigid frame formation.

19. An object or panel construction according to claim 16 wherein the perimeter rigid frame formation includes a portion with an outer edge zone adapted to form a convex curve when the outer skin of said web or webs has been wound thereon.

20. An object or panel construction according to claim 16 wherein the perimeter rigid frame formation includes a portion with an outer edge zone adapted to form a square or rectangular edge form when the outer skin of said web or webs has been wound thereon.

21. An object or panel construction according to any one of claims 6 to 20 wherein the perimeter rigid frame formation defines a polygonal shape.

22. An object or panel construction according to claim 21 wherein the polygonal shape is rectangular or square shape.

23. An object or panel construction according to claim 21 or claim 22 wherein a printed sheet is sandwiched between inner layer or layers and an outer layer or layers of said outer skin, at least the outer layer or layers being transparent whereby said printed sheet is viewable.

24. A container constructed from a panel construction according to any one of claims 1 to 23.

25. A container formed from at least four panel constructions according to claim 21, one of said panel constructions forming a base wall and the other said panel constructions forming side walls.

26. A container according to claim 25 wherein the panel constructions are connected together via hinge means such that the container can be transported in a substantially flat condition and erected into said container by an end user.

27. A container according to claim 26 wherein releasable fastening means is provided to enable said panel constructions intended to form adjacent said side walls to be releasably connected to each other.

28. A container according to any one of claims 25 to 27 wherein at least one of said panel constructions includes a printed sheet outwardly covered and retained by at least one layer of a transparent flexible plastics material web.

29. A container according to claim 28 wherein said at least one layer of a transparent plastics material web also forms an overwrap to connect and hold said panel constructions in an erect container configuration.

30. A wall construction element including at least one rectangular shaped panel construction according to any one of claims 1 to 23 further including retainer means engaging and retaining opposed edges of said panel construction.

31. A wall construction element according to claim 30 wherein at least three edges of said panel construction are held by said retainer means.

32. A container arrangement formed on a pallet base including a plurality of wall construction elements according to claim 30 or 31.

33. A wall construction element including at least one rectangular shaped panel construction according to any one of claims 1 to 23 further including one or more rigid or semi-rigid material sheets connected to the inner support frame means and substantially covering the whole of at least one side face of the panel construction.

34. A panel construction including an inner support frame means and a flexible outer skin at least partially enclosing said support frame means formed at least in part by a plurality of layers of at least one flexible web wound about said support frame means whereby at least some of said layers are adhered to other of said layers, said support frame means having two mutually parallel first frame members spaced from one another with each said first frame member having at

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least one hinge zone such that the hinge zones in the spaced first frame members are arranged in at least one pair with the or each said pair defining a hinging axis about which portions of the first frame members on either side of said hinge zones can be positioned into differing relative dispositions, after having said flexible outer skin applied to said inner support frame means.

35. A panel construction according to claim 34 wherein a second frame member connects and is secured to said first frame members at or adjacent the or each said pair of hinge zones.

36. A panel construction according to claim 35 further including at least one additional said first frame member located intermediate said two mutually parallel and spaced said first frame members, the or each additional said first frame member also including a hinge zone aligned with each said hinging axis.

37. A panel construction according to any one of claims 34 to 36 wherein each said hinge zone maintains the portions of the first frame members on either side of the hinge zone in a fixed relative position until an external force is applied to change the fixed relative position to a new fixed relative position.

38. A panel construction according to claim 37 wherein each said hinge zone includes a crease line or a region of reduced thickness relative to the portions of the first frame members on either side of the hinge zone.

39. A panel construction according to any one of claims 34 to 36 wherein each said hinge zone permits substantially free movement of the portions of the first frame members on either side of the hinge zones about said hinging axis or axes at least within a predetermined arc of movement.

40. A panel construction according to any one of claims 37, 38 or 39 further including abutment means arranged to limit movement of the portions of the first frame members on either side of the hinge zones about the hinging axis or axes to a predetermined arc of movement.

41. A panel construction according to any one of claims 34 to 40 further including an end frame member joining and connected to end portions of the two mutually parallel and spaced said first frame members to form a substantially rectangular said inner support frame means.

42. A panel construction according to claim 41 wherein the outer flexible skin includes at least one first layer of a flexible plastics material film web wound about said end frame members.

43. A panel construction according to claim 42 wherein the film web has a width to at least span the distance between said two mutually parallel and spaced first frame members.

44. A panel construction according to claim 42 or claim 43 wherein the outer flexible skin further includes at least one second layer of a flexible plastics material film web helically wound in overlapping manner about the two mutually parallel and spaced said first frame members.

45. A panel construction according to claim 44 wherein a said first layer forms an outer surface of said outer flexible skin.

46. A panel construction according to any one of claims 34 to 45 further including pressure equalizing means to ensure pressure within the outer flexible skin is the same as atmospheric pressure.

47. A panel construction according to any one of claims 34 to 46 wherein multiple said hinging axes are provided, all of said hinging axes being mutually parallel to each other.

48. A panel construction according to any one of claims 34 to 46 wherein multiple said hinging axes are provided, some of said hinging axes being disposed perpendicularly to other of said hinging axes.

49. A product including a panel construction according to any one of claims 34 to 48 wherein portions of the first frame members are moved about the hinging axes to position free end edges of the panel construction adjacent one another.

50. An object including an inner support frame means defining a substantially open region within outer perimeter dimensions of said inner support frame means and an outer skin at least partially enclosing said inner support frame means formed by a plurality of layers of at least one flexible web wound about said support frame means whereby at least some of said layers are adhered to other of said layers.

51. An object according to claim 50 in the form of a panel defining a sealed zone within the outer skin, the sealed zone having a resealable inlet / outlet opening whereby the sealed zone can hold and retain a liquid.

52. A container formed from an object according to claim 50 wherein the flexible web or webs are plastics material film wound about said support frame means in at least two directions to define a sealed zone within the support frame means and at least one inlet / outlet opening being formed in one wall of the container to enable a liquid or flowable particulate material to be retained in said sealed zone.

53. A container according to claim 52 wherein the support frame is wound in at least three directions by said plastics material film.

54. A container according to claim 52 or claim 53 wherein the support frame means includes convex curved surfaces facing outwardly of the sealed zone over which the plastics material film is wound.

55. A flat panel assembly including a plurality of panels, each said panel having a substantially rigid perimeter frame formation defining a substantially open space inwardly of said substantially rigid perimeter frame formation, said frame formation being at least partially enclosed by a plurality of layers of a

flexible plastics film web material wound about said frame formation, said panels being configured with an edge of a said panel being located adjacent an edge of at least one other said panel, and an outer envelope of a plurality of layers of a flexible plastics film web material encompassing all of said panels.

56. A flat panel assembly according to claim 55 wherein a first said panel is square or rectangular and at least one further said panel is positioned with an edge adjacent a respective edge of said first panel.

57. A flat panel assembly according to claim 55 or claim 56 wherein said envelope is formed by successively winding layers of said plastics film web material in a first direction and thereafter in a second direction disposed at an angle to said first direction.

58. A flat panel assembly according to claim 57 wherein said angle is about 90°.

59. A flat panel assembly according to claim 57 or claim 58 wherein a single layer of the plastics film web material of one winding covers the panels in the panel assembly.

60. A flat panel assembly according to claim 52 or claim 58 wherein a plurality of overlapping layers of one winding of the plastics film web material covers the panels in the panel assembly.

61. A container made from a flat panel assembly according to any one of claims 55 to 60 wherein one said panel forms a base of said container and the other said panels form side walls of said panel, said outer envelope forming a seal between adjacent edges of adjacent side walls and between adjacent edges of the base and the side walls.

62. Apparatus for wrapping a support frame means with an outer skin formed at least in part by a plurality of layers of a flexible web wound about said support frame means, said apparatus including a first conveying means and a second

conveying means, the first and the second conveying means being arranged to move the support frame means to and fro between the first and second conveying means, and a roll of said flexible web disposed between the first and the second conveying means being movable between a relatively elevated position and a relatively lowered position, the flexible web being successively positioned along a first face of the support frame means with the roll of said flexible web in the elevated position as the support frame means moves between the first and the second conveying means, whereupon, the roll of said flexible web moves to the lowered position and the flexible web is positioned along a second face of the support frame means opposite to said first face as the support frame means moves again between the first and the second conveying means.

63. Apparatus according to claim 62 wherein at least one of said first or said second conveying means is bodily repositionable about a rotation axis disposed at 90° to the plane of movement of the support frame means between the first and the second conveying means.

64. Apparatus according to claim 63 wherein a third conveying means is provided to move the support frame means in a direction 90° to the direction of movement between the first and the second conveying means, the third conveying means being cooperable with the first or the second conveying means that is bodily repositionable about said rotation axis, a second roll of flexible web being mounted for selective movement between elevated and lowered positions and disposed between said third conveying means and the first or the second conveying means that is bodily repositionable about said rotation axis.

65. Apparatus according to claim 62 wherein at least two rolls of a said flexible web is positioned between the first and the second conveying means, each of said rolls being movable between a said elevated position and a said lowered position.

66. Apparatus according to claim 62 wherein the roll is movable in an axial direction as the flexible web is applied to said support frame means.

67. Apparatus for wrapping a support frame means with an outer skin formed at least in part by a plurality of layers of a flexible web wound about said support frame means, said apparatus including a first conveying means and a second conveying means being arranged to move the support frame means between the first and the second conveying means, and at least one roll of flexible web disposed generally between said first and said second conveying means and disposed to orbit about said support frame means as it moves between the first and the second conveying means to lay helical windings of said flexible web onto said support means, said apparatus further including first flexible web application means to apply at least one flexible web length either below or over the helical windings in a longitudinal direction of said support frame means on opposed faces of said support frame means.

68. Apparatus according to claim 67 further including second flexible web application means to apply at least one flexible web on the other side of said helical windings to the flexible web applied by said first flexible web application means, the flexible web applied by said second flexible web application means being applied in said longitudinal direction on opposed faces of said support frame means.

DATED this 29th day of October 2004

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AUSTRALIA

P23618AUP3 SKP/JC

FIG 3a

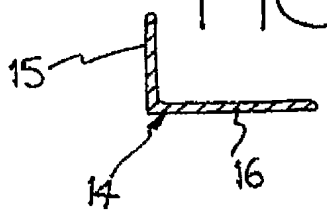


FIG 2c

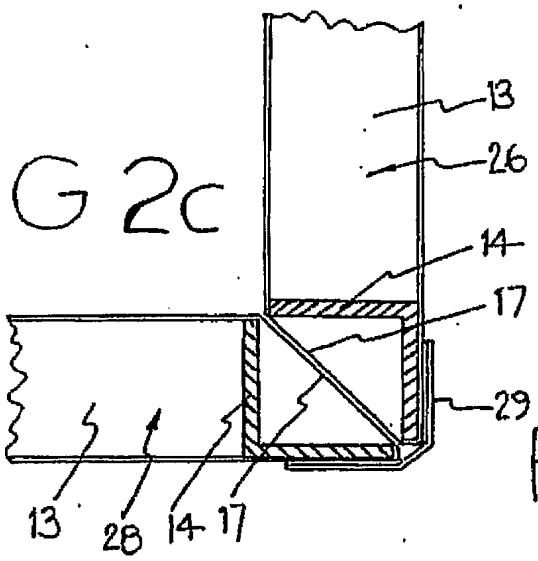


FIG 3b

FIG 3c

FIG 1a

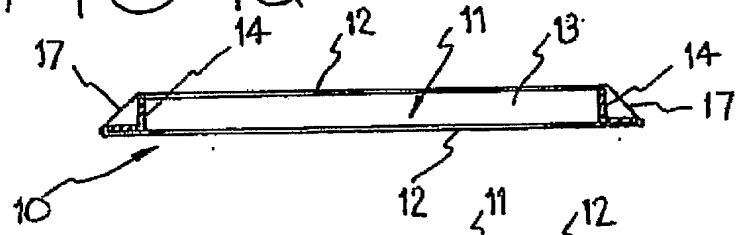
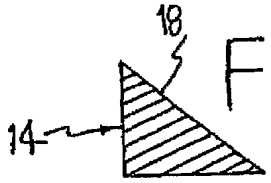


FIG 3d



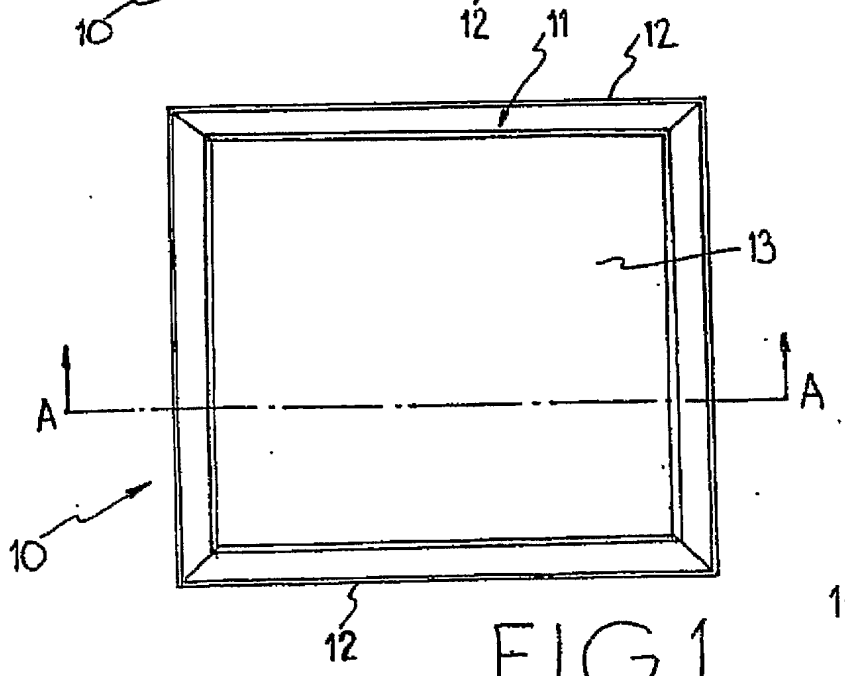


FIG 1

FIG 3e

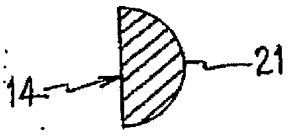


FIG 3f

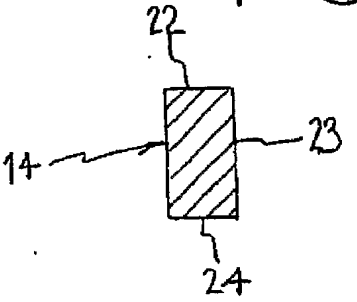


FIG 2

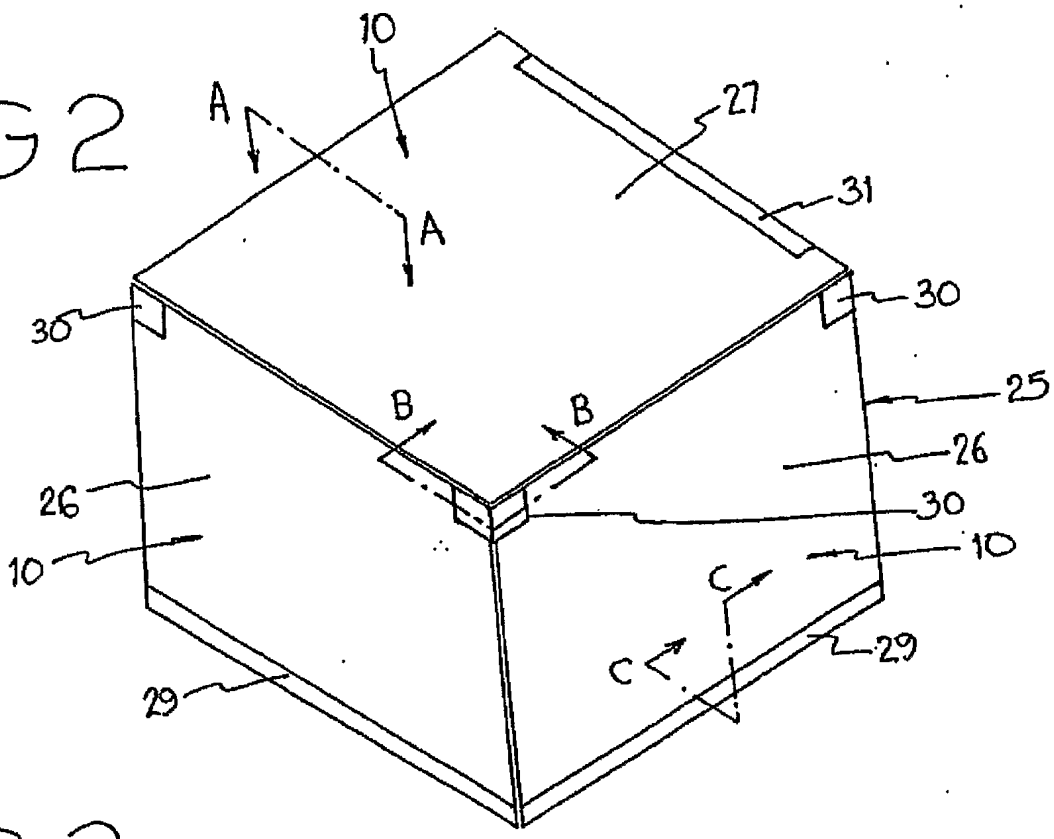


FIG 2a

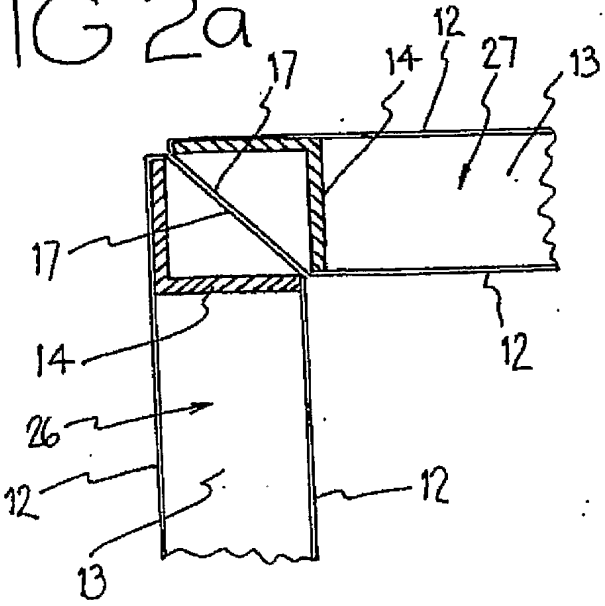


FIG 2b

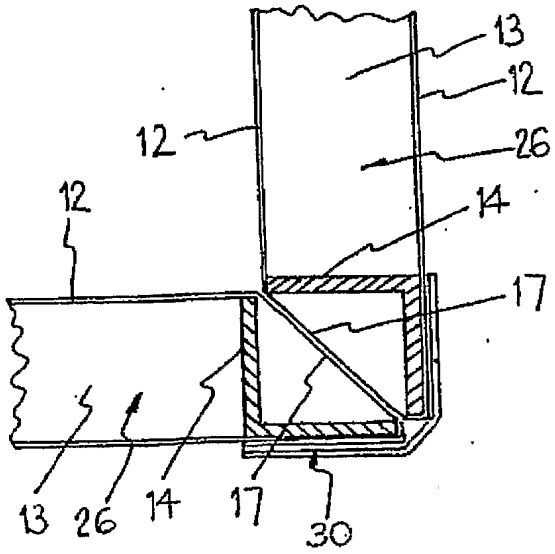


FIG 5

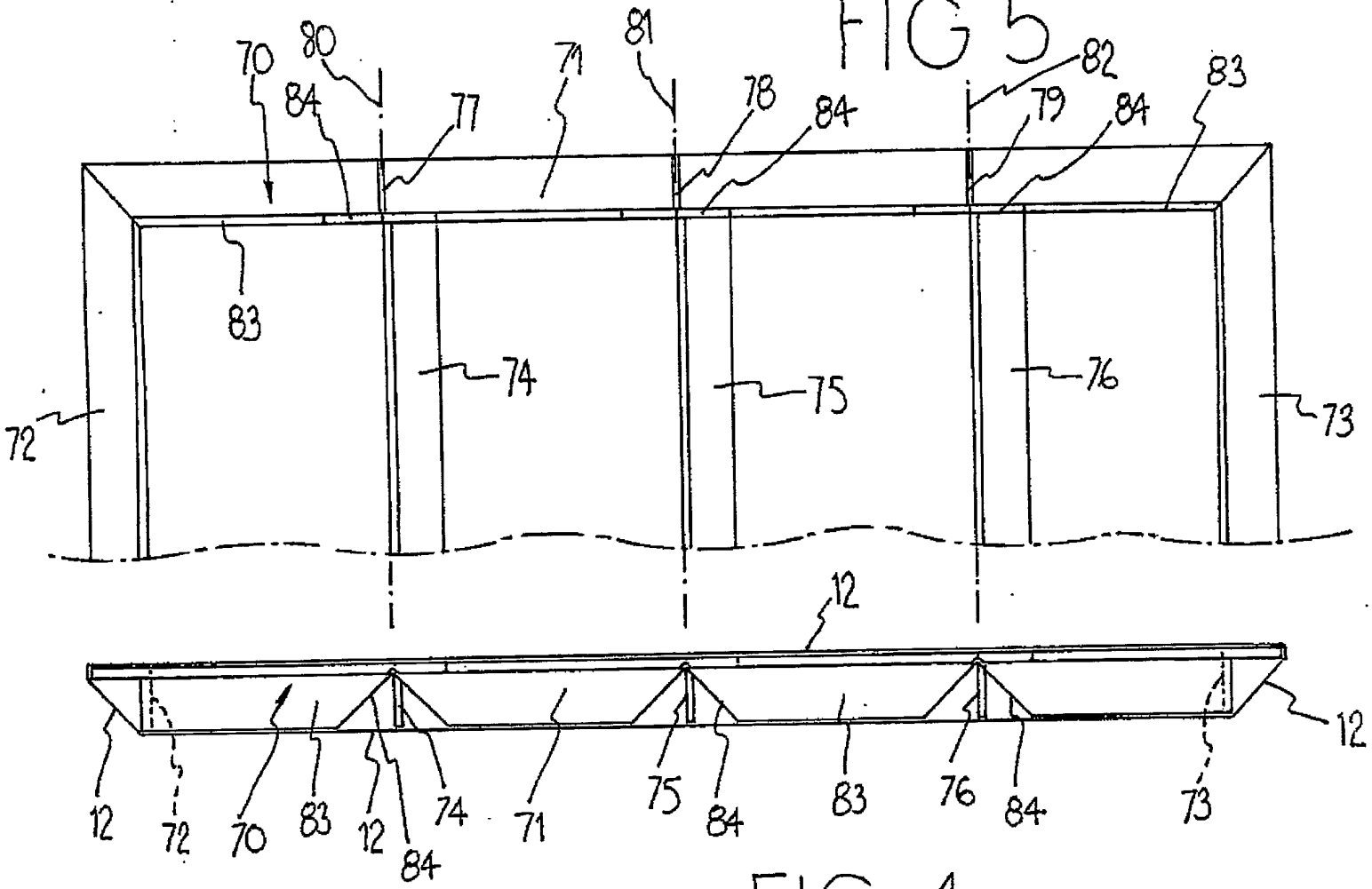

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FIG 4

FIG 5b

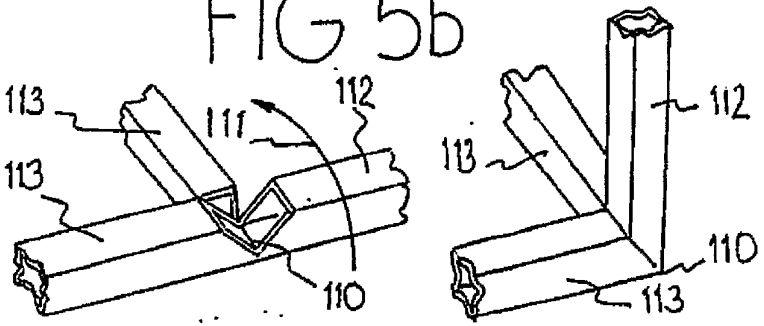
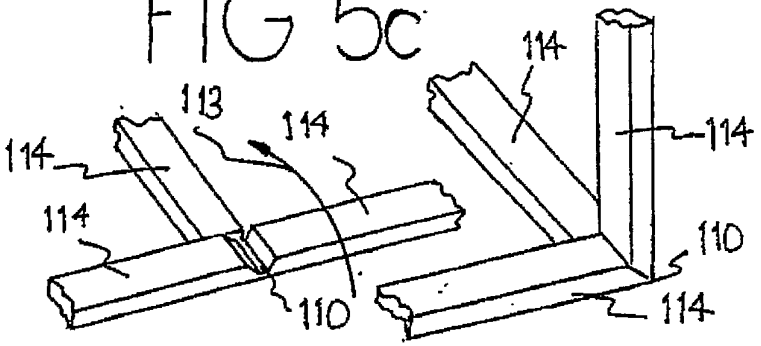


FIG 5c



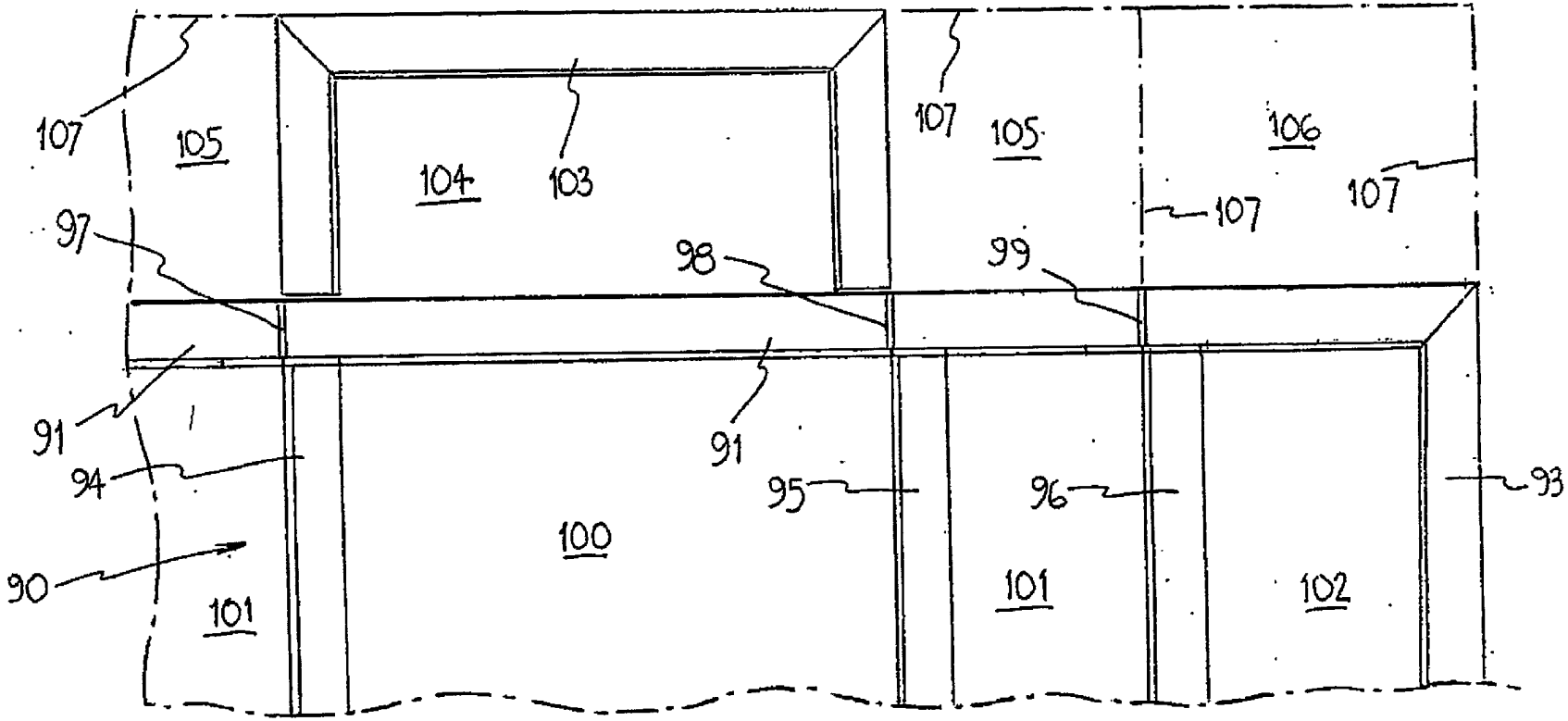


FIG 5a

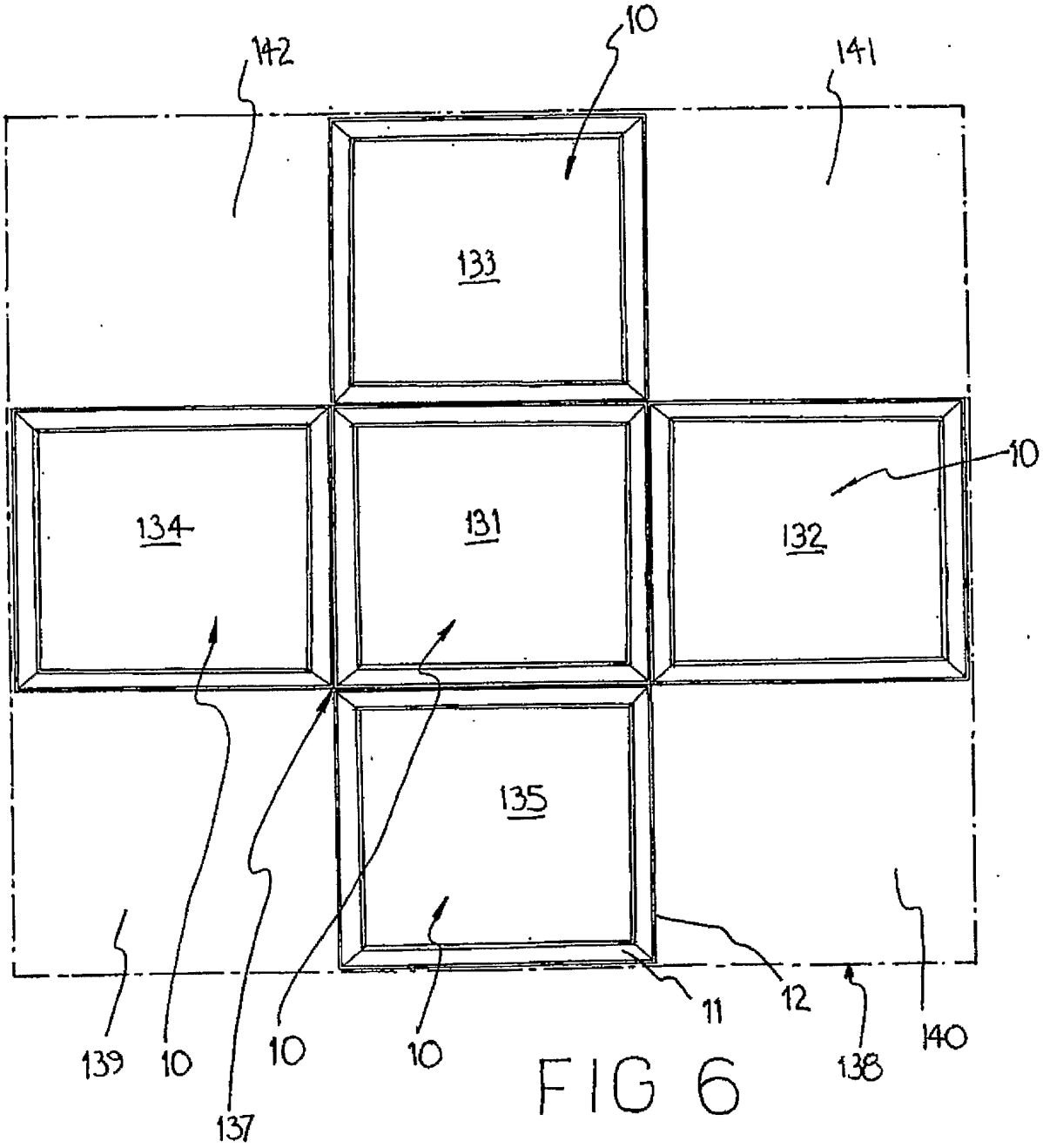


FIG 6

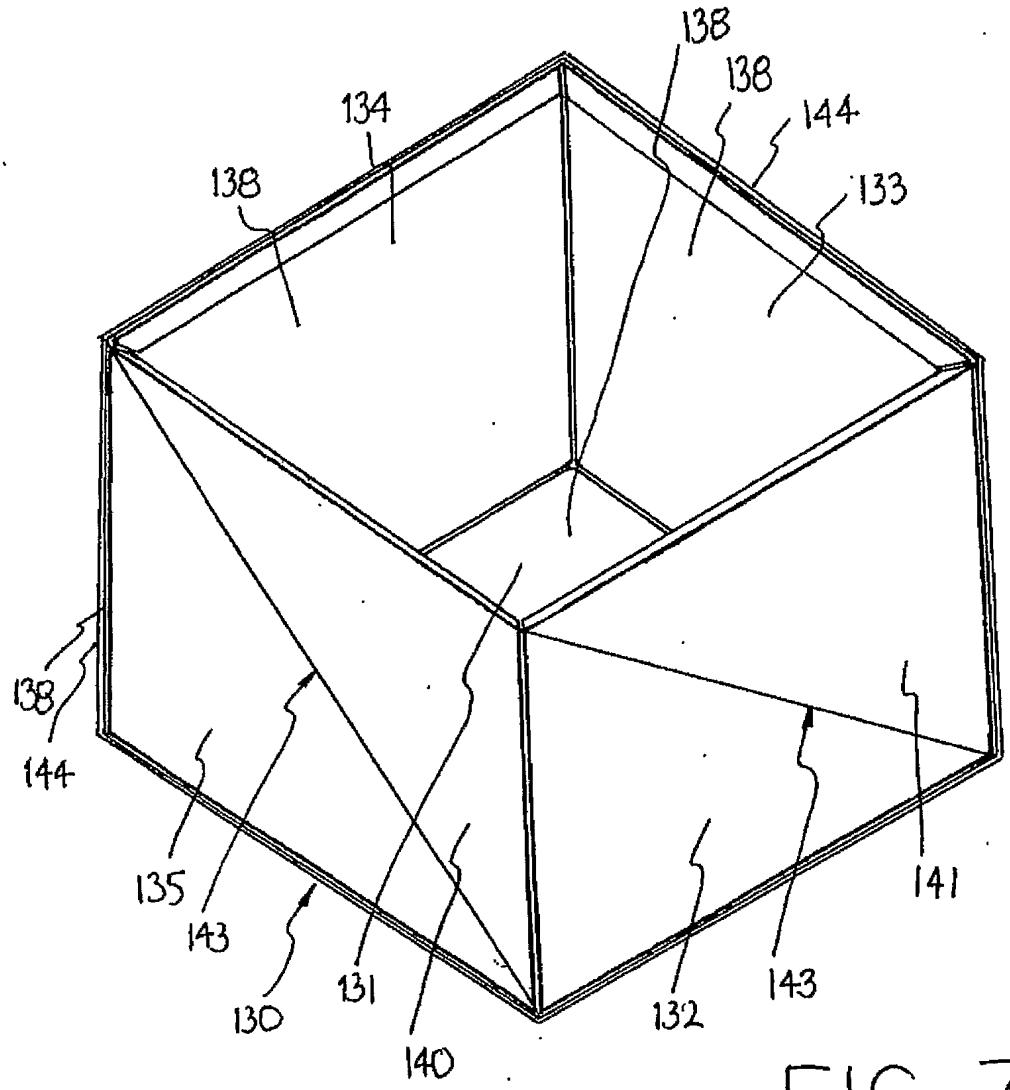


FIG 7

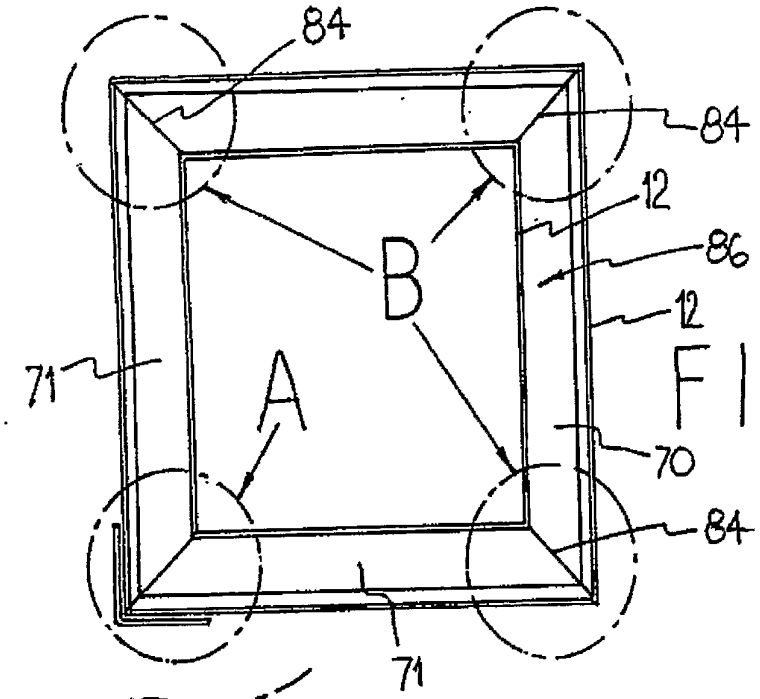


FIG 8

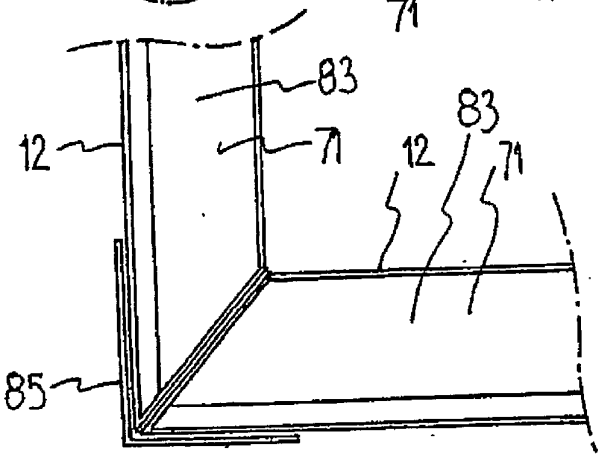


FIG 9

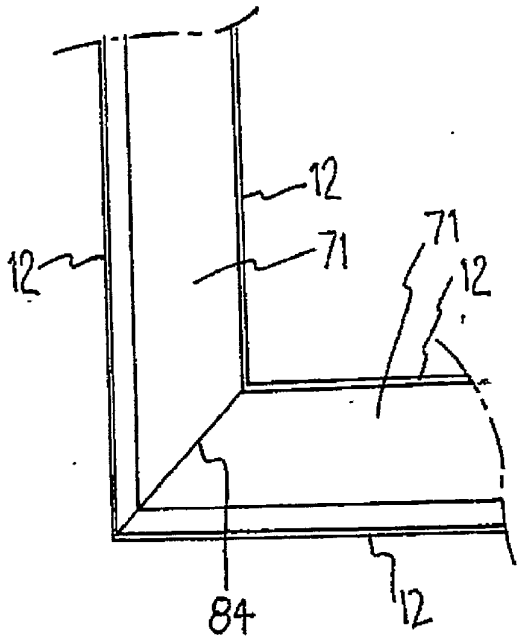
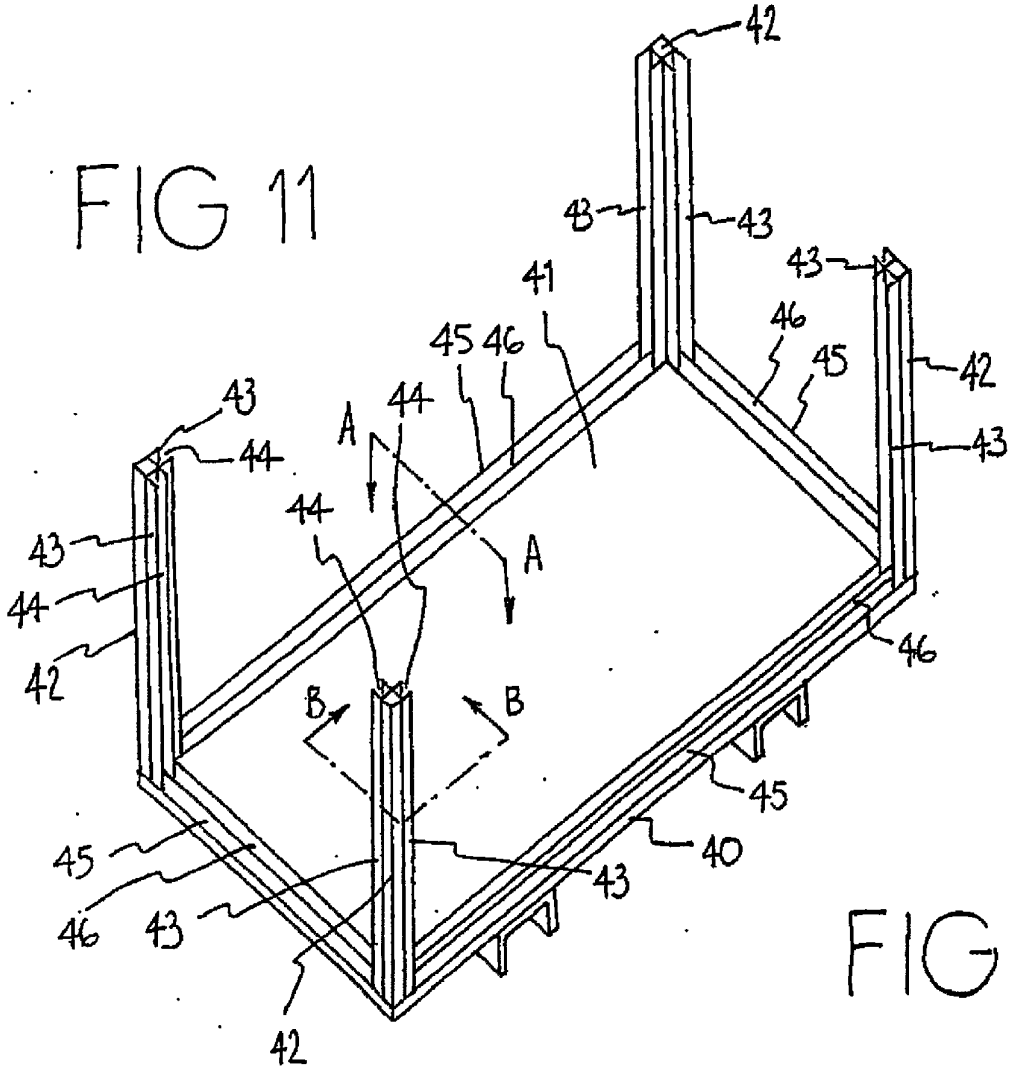


FIG 10

FIG 11



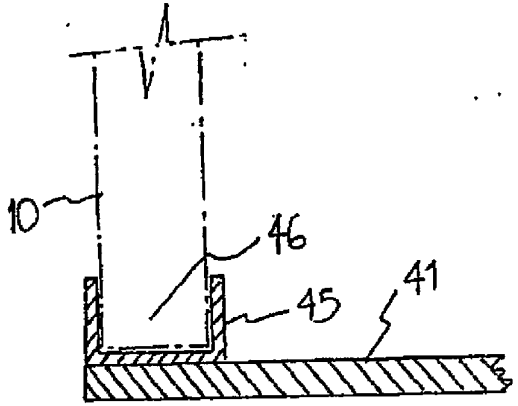


FIG 11b

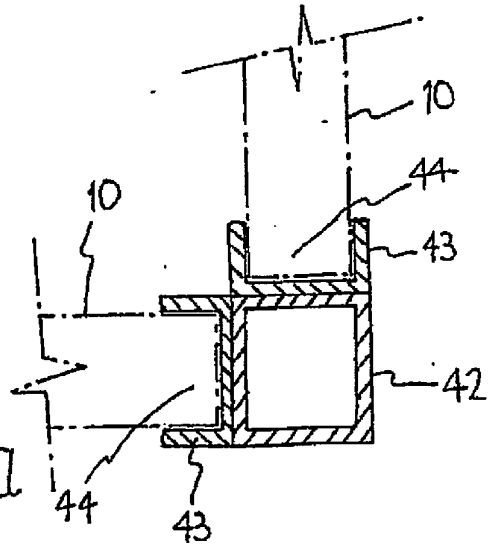


FIG 11a

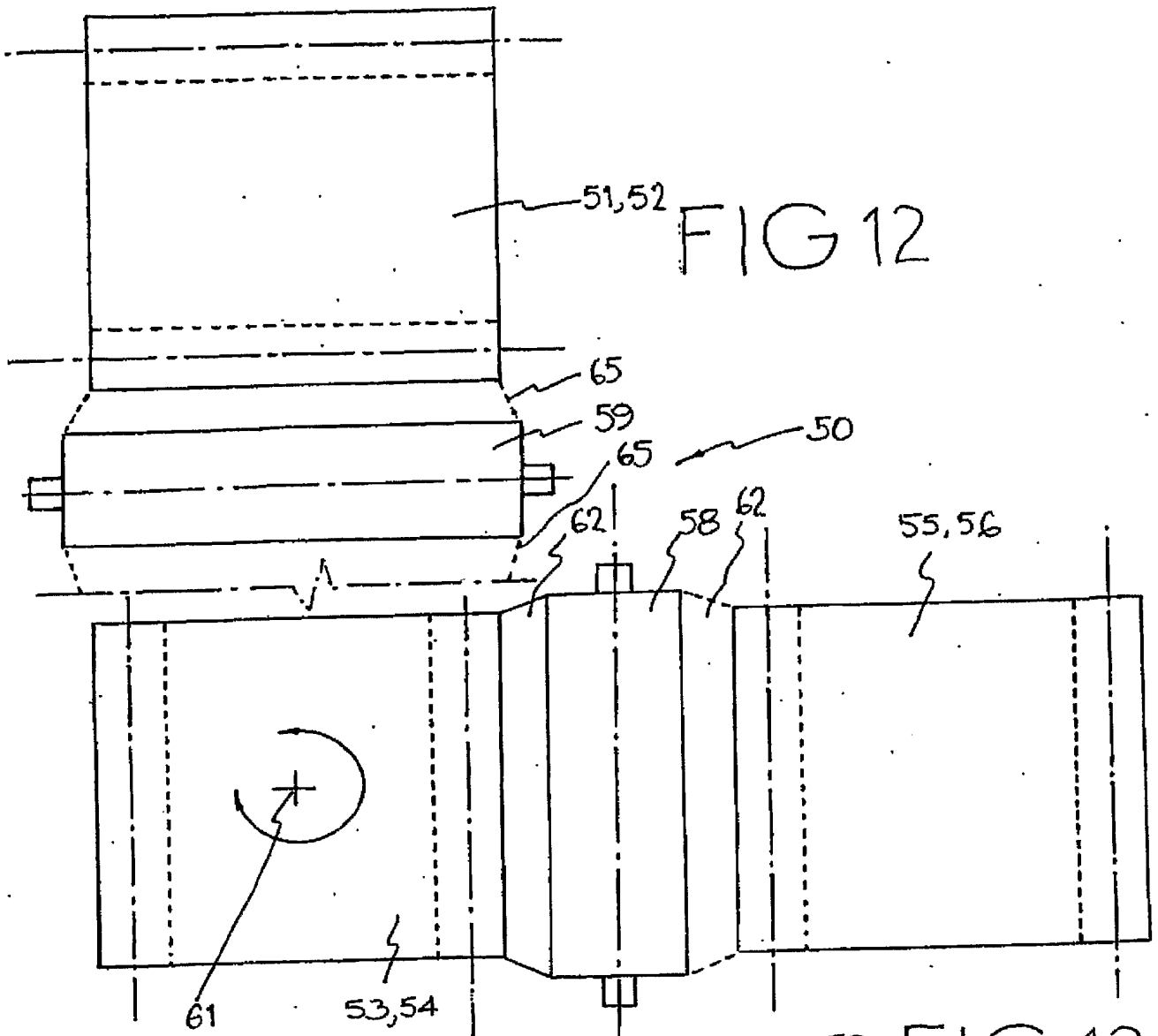


FIG 12

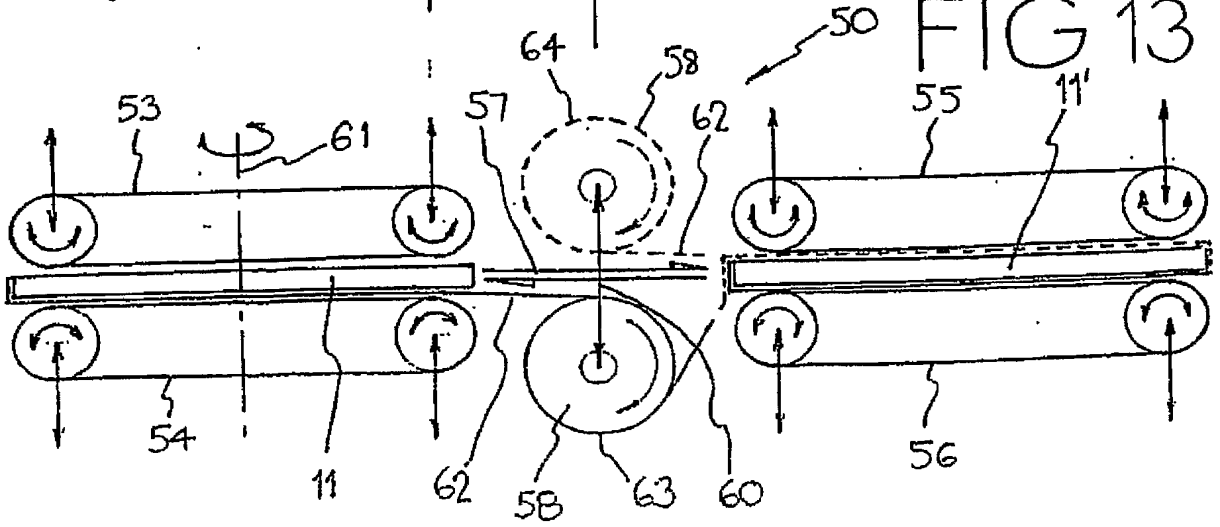


FIG 13

FIG 14